植物研究雑誌
J. Jpn. Bot.
76: 1–10 (2001)

Originals

New and Misunderstood Species of Japanese *Pannaria* (Lichenes)

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(Received on July 15, 2000)

Japanese species of the lichen genus *Pannaria* were revised. A new species in the *P. rubiginosa* group, *P. asahinae* P.M.Jørg. was described. *P. globuligera* Hue and *P. insularis* P.M.Jørg. & Kashiw., sp. nov. in the *P. lurida* group were recognized. A key is given to the sorediate/isidiate taxa recognized at present. Only material of *P. lurida* from meridional Japan belongs to subsp. *lurida*, whereas that from Hokkaido and northern Honshu belongs to subsp. *russellii* (Tuck.) P.M.Jørg., though often containing pannarin. *P. tavaresii* P.M.Jørg. is recorded as new to Japan. The term gymnidium is introduced for the special ecorticate lobules found on *P. globuligera* and several other species of the Pannariaceae. All names are typified when necessary.

Key words: gymnidium, Japan, new species, *Pannaria*

While revising Japanese material of the Pannariaceae, it became clear that specimens named *P. rubiginosa* did not correspond with this species in strict sense. Just as in North America (Jørgensen 2000) there is a need to recognize a further species in this complex. Also the *P. lurida* group, particularly the sorediate/isidiate taxa, proved to be complex and a revision has been attempted below.

1. **Pannaria asahinae** P.M.Jørg., sp. nov. [Fig. 1]

Pannariae rubiginosae similis, sed thallo minore, fulvo, squamulis numerosis, acidum pannaricum destituto et sporis minutis.

TYPE: JAPAN. Honshu, Prov. Suruga, Ohmiya-guchi, 2-gome, Mt. Fuji, 23 Aug. 1923, A. Hashimoto (TNS, holotype).

Thallus orbicular, fawn, to 3 cm in diam., mostly squamulose, sometimes with radiating marginal lobes to 3 mm broad, and 150 μm thick with distinct cellular cortex, to 40 μm thick, PD–. Lobes often with secondary marginal lobules, resting on a distinct blackish mat of rhizohyphae. Apothecia common, particularly centrally, to 2 mm diam. with distinct squamulose; thalline margin often with a crown of hairs below; disc brown; hymenium to 150 μm wide, I + blue in vicinity of the asci which have no apical

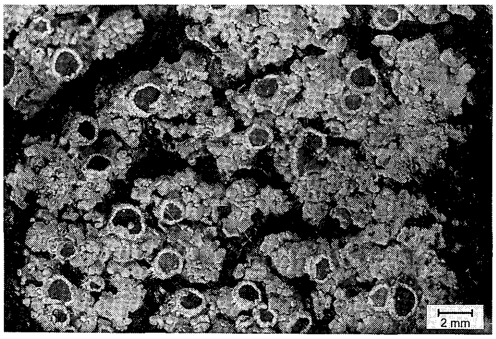
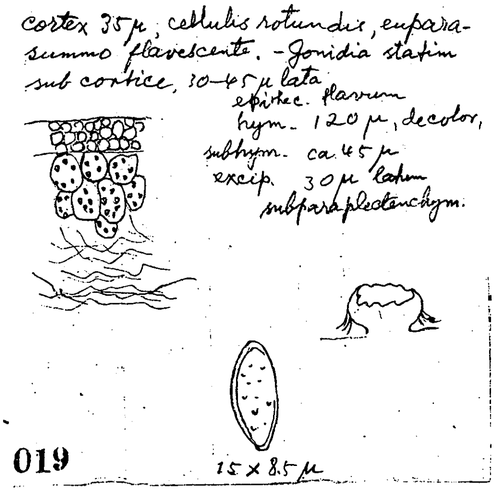


Fig. 1. *Pannaria asahinae*, holotype.

amyloid structures and contain eight spores; ascospores simple, colorless ellipsoid, weakly rugulose on the surface, 12–15 × 7–9 μm.

Notes: *Pannaria asahinae* is a most distinctive species, looking quite different from *P. rubiginosa* due to its small size, tawny brownish color and numerous squamules. Further details support its distinctness: no lichen acids, smaller spores and apothecia mostly being hairy below, as being recognized by Asahina (Fig. 2) when he annotated some of these specimens as f. *inactiva* and f. *ciliata* in his herbarium. *Pannaria asahinae* is in fact much closer to the recently described species *P. subfusca* P.M.Jørg. from eastern North America, and may be regarded as a vicariant of that species, from which it differs in the larger, more ellipsoid spores, the hairy apothecia and the thicker, more squamulose, fawn brown thallus.

Because of these characters *P. asahinae* has in the past also been confused with *Fuscopannaria leucosticta* (Tuck.) P.M. Jørg., from which it is easily distinguished by the deep brown color of the latter with contrasting white lobe-margins (See color plate 41, figs. 410 and 412 in Yoshimura 1974, where fig. 410 named *P. rubiginosa* is *P. asahinae*). In cases of doubt, they are discriminated with certainty on the hemiamyloid hymenium and asci with amyloid ring-structure of *F. leucostica* and its contents of terpenoids in the thallus.



cortex 35μ, cellulis rotundis, euparasummo flavescente. - Gonidia statim sub cortice, 30-45μ lata

epithec. flavum

hym. 120μ, decolor,

subhym. ca. 45μ

excip. 30μ latum

subparaplectenchym.

Fig. 2. Asahina's annotation on the type specimen of *Pannaria asahinae*.

Pannaria asahinae is a somewhat variable species. The peripheral lobes are mostly poorly developed, but in some specimens they are prominent. Such specimens approach *P. rubiginosa* in appearance, but are always deep brown with small-squamulose central parts, and have smaller spores and no PD reaction. The secondary lobules in some poorly developed specimens are reduced to isidia-like structures, but remain flattened and dorsiventral.

Ecology and distribution: *P. asahinae* is mainly a corticolous species of temperate, deciduous forests, as yet only known from Japan where it appears to be commonest in southern parts of Honshu (though possibly over represented in the herbaria from there), but also reaching Hokkaido.

Specimens examined HOKKAIDO. Prov. Ishikari, Mt. Ashibetsu, 25 July 1935, Y. Asahina s.n. (TNS). HONSHU. Prov. Kozuke, Mt. Akagi, 6 Aug. 1911, A. Tsunoda s.n. (TNS). Prov. Musashi, Mt. Buko, Chichibu-gun, 7 Nov. 1923, Y. Asahina s.n. (TNS). Prov. Sagami, Hakone, lakeside of Ashinoko, 7 Sept. 1952, Y. Asahina s.n. (TNS). Prov. Shinano, Daimon Pass, lakeside of Shirakabako, 9 May 1955, M. Togashi s.n. (TNS); Mt. Yatsugadake, 4 Aug. 1916, A. Yasuda s.n (TNS); Mt. Nishikomagatake, 9 Aug. 1922, A.Yasuda (TNS). Prov. Izu, Mt. Amagi, Y. Asahina 240 (TNS); Yugashima, Tagata-gun, 2 Jan. 1924, Y. Asahina s.n. (TNS); without detail locality, A. Yasuda 66 (TNS). Prov. Suruga, Subashiri-guchi, Mt. Fuji, 1924, Y. Asahina s.n. (TNS). Prov. Kii, without detail locality, 2 Apr. 1924, Y. Asahina s.n. (TNS). SHIKOKU. Prov. Awa, Kito-mura, Naka-gun, alt. 480 m, 7 Nov. 1978, H. Kashiwadani 14877 (TNS).

2. **Pannaria gemmascens** Nyl., Lich. Jap. 36 (1890) – TYPE: Japan, Umagaeshi, 1-gome, Mt. Fuji, E. Almquist 1879 (H-Nyl

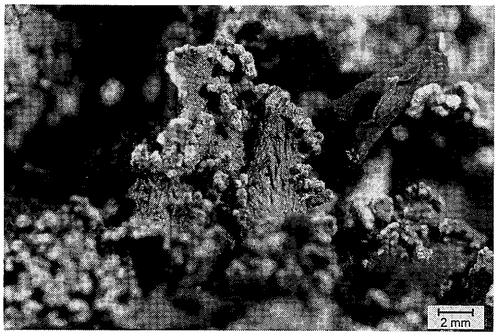


Fig. 3. *Pannaria gemmascens*, specimen from Mt. Garyu.

31269, lectotype, here designated). [Fig. 3]

Thallus squamulose, to 3 mm diam., strongly wrinkled, swelling when wet to 400 µm thick, bluish brown with marginal bluish gymnidia (see below) with terpenoid crystals. All chemical reactions negative, containing terpenoids, which in the herbarium often are visible as needles. Apothecia unknown.

Notes: This has been a problematic species for all who has worked with Japanese lichens due to the few (for long only the small type) collections, all without apothecia. Hue (1906) regarded it incorrectly as a *Collema*, probably because of the swelling thallus, and he was followed by many subsequent botanists including Zahlbruckner (1924). The species has, however, a true upper cortex and contains terpenoids, which clearly excludes *Collema*. Its anatomy is that of the *P. lurida* group, but the chemistry is at variance with those species. Still we prefer to keep it in *Pannaria*, since no *Fuscopannaria* is known to have such anatomy of the thallus.

Pannaria gemmascens is possibly closest related to *P. insularis*, but differs in the thicker, more swelling, deeper wrinkled thallus with gymnidia (see below), and the lack of pannarin.

Habitat and distribution: This species has been collected only from central Honshu.

Specimens examined HONSHU. Prov. Kozuke, on trail from Mt. Mikuni to Mt. Tairappyo, Tone-gun, alt. c. 1700 m, 18 Sept. 1979, H. Shibuichi 5967 (TNS). Prov. Bitcu, Rashomon, Kusama, Niimi-city, alt. 360 m, 9 May 1981, H. Kashiwadani 16757 (TNS). Prov. Hoki, Mt. Daisen, 18 July 1931, K. Yasuda s.n (TNS). Prov. Inaba, Mt. Mani & Tottori, 1931, K. Yasuda s.n. (TNS). Prov. Oki, Mt. Takuhi, Chibu-gun, alt. 260 m, 31 May 1969, H. Kashiwadani 5831 (TNS). Prov. Aki, Mt. Garyu, Yamagata-gun, alt. 900–1000m, 21 Sep. 1969, H. Kashiwadani 6233 (TNS).

3. **Pannaria globuligera** Hue in Nouv. Arch. Mus., ser. **4, X**. 181 (1909)–TYPE: Korea, Hallisan, corticolam, Oct. 1906, R. Faurie 785 (BM, isotype!). [Fig. 4]

Syn.: *Pannaria limbata* Vain. in Ann. Acad. Sci. Fenn. ser. A **15 (6)**:17 (1920)–TYPE: The Philippines, Polillo, in arbore, C. B. Robinson, Bur. Sci. 9081 (TUR-Vain, holotype!).

Thallus foliose, orbicular, up to 5 (10) cm diam., loosely adnate. Lobes irregularly radiating, 3–5 mm wide. Upper surface fawn to brownish, when dry partly wrinkled with cortex up to four layers of cells, to 35 µm wide. Thallus swelling when wetted and then up to 0,4 mm thick. Lobe-margins with flattened to globular, bluish ecorticate secondary lobules (Figs. 7, 8), appearing like soredia. Lower surface naked whitish, yellowish towards the center with bundles of white to

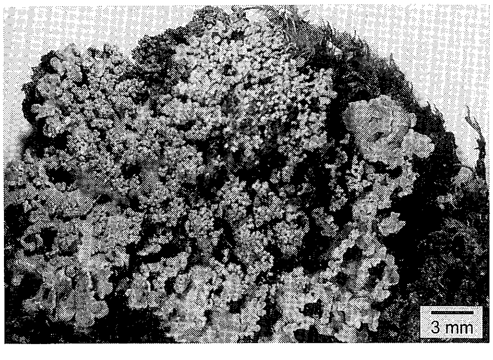


Fig. 4. *Pannaria globuligera*, typical specimen.

blue-black rhizohyphae. Cyanobiont small-celled (4–6 mm) in chains, sometimes coiled with strongly swelling gelatinous sheets. Thallus PD+ orange, containing pannarin and often terpenoids.

Apothecia rare, not known in Japanese material, often marginal, sessile, to 2 mm wide with distinct thalline margin and brown disc. Ascospores simple, colorless, ellipsoid 15–20 × 9–10 μm, often apiculate, at least in one end.

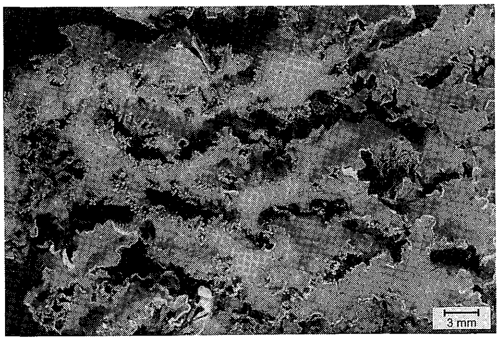


Fig. 5. *Pannaria elatior*, specimen from Yaeyama.

Notes: This is the taxon which was previously mistaken for *P. fulvescens* in Japan (Jørgensen 1994), from which it is rather easily separated by having ecorticate lobules on the upper surface of the margins, rather than coarse-grained soralia on the upturned lower surface (Fig. 7).

This kind of vegetative dispersal unit is now known from a number of species in the Pannariaceae (in addition to *Pannaria granuligerum*): *P. conoplea* (Ach.) Bory, *P. gemmascens* Nyl., *Fuscopannaria coelulescens* P.M.Jørg. (Jørgensen 1999) and an undescribed South American *Parmeliella*). It is a distinct agent of dispersal which in fact

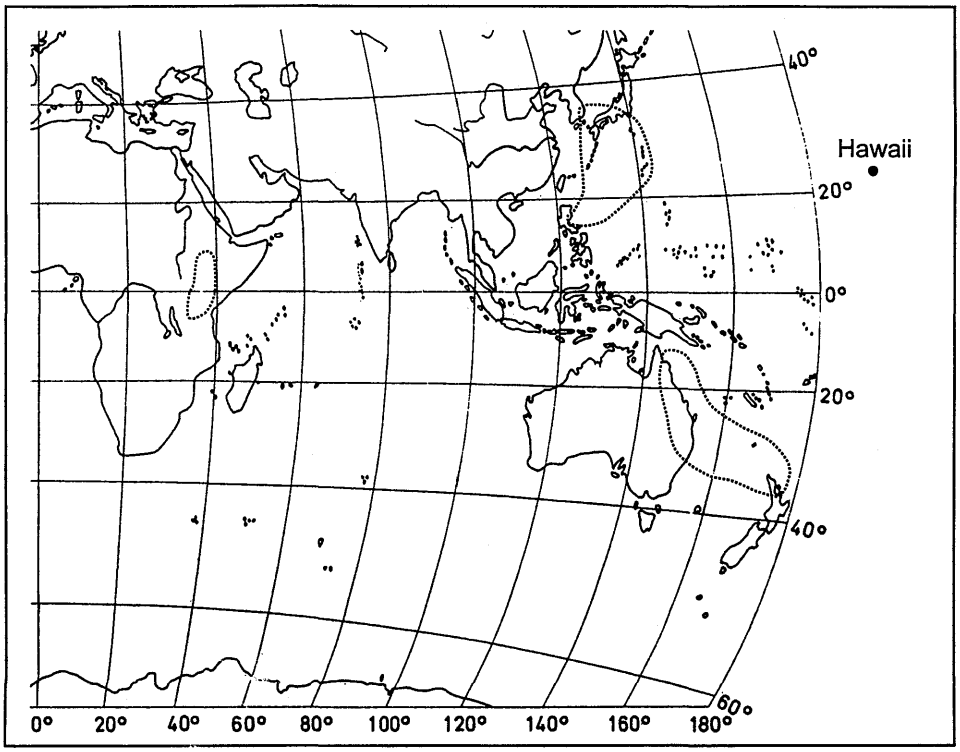


Fig. 6. World distribution of *Pannaria globuligera* (within dotted lines).

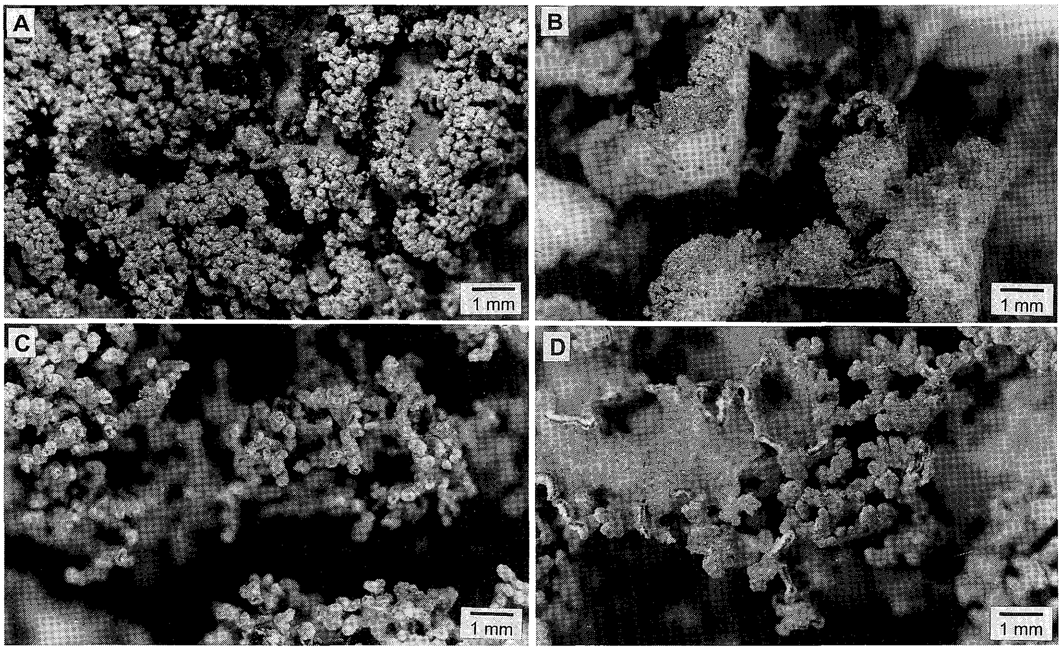


Fig. 7. Details of marginal outgrowths. A. *Pannaria globuligera* (gymnidia), B. *P. fulvescens* (soredia), C. *P.elatior* (isidia), D. *P. exasperata* (squamules).

is functioning both as soredia, dispersing packages with fungus and cyanobiont, and as isidia when breaking off. As this is such a distinct structure, it may need to be notified by a special term, just like several other special cases (e.g., Poelt 1980). We propose **gymnidium**, from Greek gymnos= naked, referring to the lack of cortex (Fig. 8).

Gymnidia may start as flattened secondary lobules or as rather isidia-like structures, as seen in the type specimen of *P. globuligera*, which extend by ecorticate growth, becoming rather soredia-like, as in the type of *P. limbata*.

Specimens with well-developed gymnidia are in fact easily confused with *P. conoplea*, a species with similar gymnidia, but with a different, non-wrinkled thallus, containing glomerules of large-celled *Nostoc*. Specimens with globular, young gymnidia may be difficult to separate from the isidiate *P. elatior* Stirt., a species which with certainly is only known as far north as Taiwan and the southernmost of the Ryukyu Islands (the Sakishima Islands, Fig. 5). They have the same anatomy, but the isidia of *P. elatior* are more coralloid and corticate (Figs. 7, 8).

Ecology and distribution: *P. globuligera* is a corticolous species, occasionally found on mossy rocks, of moist forests, mainly in the lowlands, though extending into the montane region of warm-temperate to subtropical regions (Fig. 6). In Japan it is confined to the southernmost parts (up to about 1000 m), extending southwards to the Philippines, and it is also rather common in the mangroves and forests of eastern Australia and northern New Zealand. In the Pacific region it has also been collected in Hawaii. There is a extremely disjunct occurrence in the mountains of East Africa where *P. globuligera* appears to be rather common in motane forests, 1500–3000m from Ethiopia to Tanzania, but they named it *P. fulvescens* and present an

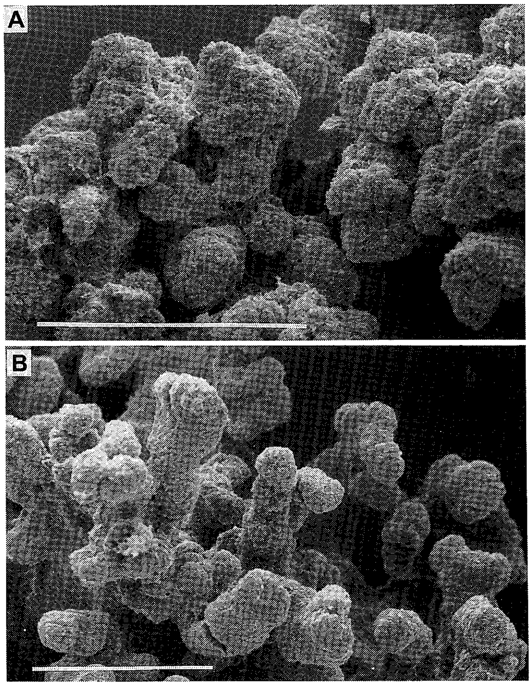


Fig. 8. SEM picture showing A. Ccorticate flat, gymnidia from *Pannaria globuligera*, B. Corticate, coralloid isidia of *P. elatior*. Scales: 500 µm.

excellent color photo on plate 10C of *P. globuligera* (Swinscow and Krog 1988).

Japanese specimens examined. HOKKAIDO, Prov. Hidaka, Horai-iwa, Mitsuish-cho, alt. 20 m, 2 July 1981, Y. Taskahashi 8 (TNS). HONSHU. Prov. Rikuchu, Mt. Yakeishi, Isawa-gun, alt. 1100 m, 26 Aug. 1983, H. Kashiwadani 20367 (TNS). Prov. Ugo: Maedake, Mt. Taihei, Akita, 29. Aug. 1959, T. Kumagaya 9 (TNS). Prov. Musashi, Mt. Buko, 8 July 1922, Y. Asahina (TNS). Prov. Izu, Mt. Amagi, 26 July 1924, Y. Asahina 239 (TNS); Honryuiji Temple, Nirayama, 5 Jan. 1956, Y. Asahina (TNS); Hachijo Island: Okasato, Ohkago, 16 March 1957, M. Togashi (TNS). Prov. Sagami, Saijoji Temple, Mt. Daiyu, Odawara, 31 Dec. 1956, M. Togashi (TNS). Prov. Suruga, Mt. Ashitaka, Oct. 1922, Y. Asahina (TNS); Mt. Fuji, Gotemba, 18 Aug. 1931, Y. Asahina (TNS). Prov. Yamashiro, Atago Shrine, 20 Nov. 1957, M. Togashi s.n. (TNS). Prov. Yamato, Mt. Sanjohgatake, Ohmine Mts., 10 June 1952, M. Togashi s.n. (TNS); Mt. Ohdaigahara, 3 May 1968, F. Fujikawa s.n. (TNS). Prov. Kii, Mt. Koya, Ito-gun, 14 Sept. 1927, Y. Asahina 26 (TNS); the same locality, alt. 880 m, 6 April 1972, H. Kashiwadani 5831 (TNS). Prov. Aki, Mt. Kanmuri, Saeki-gun, alt. 1100 m, 12 June 1966, H. Kashiwadani 311 (TNS). SHIKOKU: Prov. Awa, Jinryo-mura, Myozai-gun, 7 Jan. 1940, T. Inobe s.n. (TNS); Nakazu, Kamiyama-mura, Myozai-gun, 14 June 1939, T. Inobe 36 (TNS); Todoroki Shrine, Kareidani, Kawakami-mura, Kaibu-gun, 24 July 1955, M. Togashi s.n. (TNS). Prov. Iyo, Mt. Ishizuchi, 6 June 1952, T. Yanagisawa 1699 (TNS). Prov. Tosa, Nokawa, Kitagawa-mura, Aki-gun, 12 Aug. 1931, F. Fujikawa s.n. (TNS). KYUSHU. Prov. Hizen: Nagasaki, U. Faurie 3628 (BM). Prov. Chikuzen, en route between Nakadake and Kitadake, Mt. Hikosan, Soeda-machi, Tagawa-gun, alt. 1140 m, 16 May 1952, S. Kobayashi. s.n. (TNS) Prov. Higo: Issyochi, Kuma-gun, 9 Jan. 1927, K. Mayebara 34 (TNS); Ueda, Oguni-cho, Aso-gun, alt. 50 m, 28 Oct. 1979, Y. Umezu 57 (TNS). Prov. Hyuga (Pref. Miyazaki),: Miyazaki-shi, Boroishiyama, alt. 200–500 m, 27 May 1970, T. Koponen 11093 (H). Prov. Ohsumi, Hananoego, Yakushima Isl., Kumage-gun, 27 July 1933, F. Fujikawa (TNS); Kosugidani, alt. c. 670 m, M. Ohmura 669 (TNS). Bonin Islands. Hahajima: Mt. Chibusa, in forest of *Ardisia sieboldii*, alt.250–400 m, 13 July 1969, H. Inoue 19698 (TNS).

4. **Pannaria insularis** P. M. Jørg. & Kashiw., sp. nov. [Fig. 9]

Pannariae luridae similis, sed thallo minore, squamuloso et marginibus lobulatis.

TYPE: Japan, Ryukyu, Tokunoshima Isl., Ohsima-gun, Mt. Inokawa-dake, alt. 520 m, 21 March 1967, H. Kashiwadani 2018 (TNS, holotype).

Thallus squamulose, forming orbicular patches to 3 cm diam., brownish to greenish, often with sinuose, white-pruinose margins with secondary lobules, up to 250 µm thick with 3-layered cortex, to 30 µm thick, and coiled aggregations of small-celled *Nostoc*; PD + orange, containing pannarin, terpenoids and fatty acids. Apothecia rare, to 1.5 cm, with brown disc and distinct thalline, squamulose margin. Hymenium I+ blue in the vicinity of the asci which lacks internal amyloid structures. Ascospores, simple, colorless, ellipsoid 14–15 × 8–9 µm, without distinct perispore.

Notes: Material of this species has partly

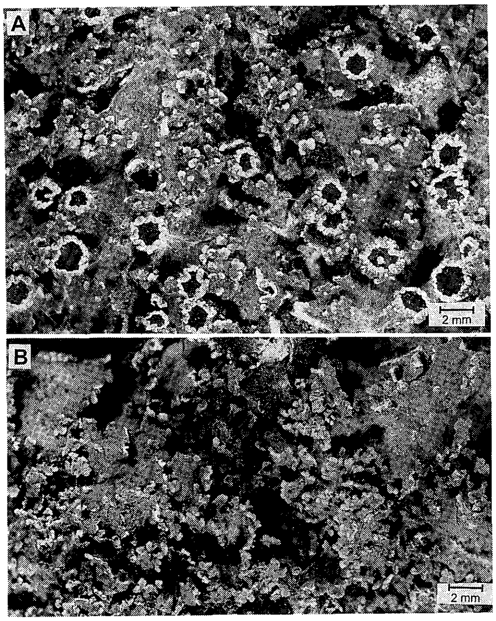


Fig. 9. *Pannaria insularis*, A. Fertile specimen with white-pruinose thalline margins, B. Holotype specimen.

been referred to as *Pannaria lepidella* (Räs.) Kurok., but study of the type (from Hoki, Yasuda, H) has revealed that material to be a large, broad-lobed lichen without secondary marginal lobules falling within the variation of Japanese *P. lurida* (Mont.) Nyl. *Pannaria insularis* is a much smaller, partly squamulose species, producing marginal lobules which often appear like white "teeth" along the margin. In this latter character it approaches *P. exasperata* H.Magn. from Hawaii, which, however, has a thinner more broad-lobed, PD– thallus (see key below). It appears closer related to *P. ramosii* Vain., a species described from the Philippines, but also that is a thinner, more broad-lobed species of a different more greenish color, not containing terpenoids.

Pannaria insularis is rather variable, particularly in the secondary lobules, which are not always teeth like, but in some cases are plentiful, imbricate and non-pruinose. It has a unique chemistry, combining two chemosyndromes; pannarin and/or related substances as typical in *Pannaria* and terpenoids and fatty acids as in most species of *Fuscopannaria*. It is notable though that the terpenoids are not the same as those of the *Fuscopannarai leucosticta* complex, to which it has some superficial resemblance, and have Rf values about 4 in system B, rather than 8–9. It undoubtedly belongs to *Pannaria* due to the hymenial characters and the anatomy of the thallus. This latter character places *P. insularis* in the difficult *P. lurida* group, which apparently has developed a whole series of taxa with vegetative dispersal units. This group is in need of further detailed evaluation, but at present we accept five species which are morphologically recognizable and have different and overlapping distributions. They may be distinguished as follows:

1. Thallus with bluish soredia/gymnidia 2
1. Thallus with grayish brown isidia/lobules 4
2. Granular soredia present on the upturned lower surface of lobes, South Pacific (Tasmania–Tahiti) .... *P. fulvescens* (Mont.) Nyl.
2. Gymnidia present on upper surface of lobes 3
3. Thallus small, strongly wrinkled, P–, with terpenoids, local (Japan) .... *P. gemmascens* Nyl.
4. Thallus larger, smooth, P+ orange, without terpenoids, widespread (East Africa, Australasia and Hawaii) .... *P. globuligera* Hue
5. Coralloid isidia present on lobe margins, P+ orange, widespread (Southeast USA–Southern Africa) .... *P. elatior* Stirt.
4. Flattened lobules present on lobe margins, varying reaction, local taxa 5
5. Thallus thin (c. 150 μm), P–, secondary lobules imbricate, non-pruinose (Hawaii) .... *P. exasperata* H.Magn.
5. Thallus thicker (c. 250 μm), P+ orange,

secondary lobules "teeth"-like, mostly pruinose (Japan) ....
.... *P. insularis* P.M.Jørg. & Kashiw.

One of a still unresolved questions relates to some specimens from southern Honshu which may be identified as *P. elatior* as they are isidiate, but which differ both habitually and in anatomy, and thus represent either an extreme form, or a new species. This matter needs further studies, particularly in the field.

Habitat and distribution: As yet only known from the islands of southern Japan (hence the epithet), and a few collection in southern Honshu, within the meridional zone of Hämet-Ahti & al. (1974). It is mainly a corticolous species of the lowlands (to c. 500 m), growing on smooth, acidic bark (*Ligustrum, Pinus, Prunus, Zelkova*), occasionally also saxicolous.

Specimens examined. JAPAN. HONSHU. Prov. Idzu, Mt. Shiroyama, Ohito, Tagata-gun, 28 Dec. 1951, Y. Asahina 5128 (TNS); Mito seashore, Tagata-gun, 4 Jan. 1929, Y. Asahina 2914 (TNS); Shimoda, 25 March 1934, Y. Kobayashi (TNS). Izu Islands: en route from Tairo-ike to Usuki, Miyake Isl., 6 March 1973, S. Kurokawa 73011 (TNS). Prov. Izumo, Mt. Makuragi, Matsue-city, alt. c. 420 m, 9 May 1971, H. Kashiwadani 8823 (TNS). Prov. Oki: Mt. Takasaki, Chibu-gun, alt. 370 m, 2 June 1969, H. Kashiwadani 5779 (TNS); Tamawakasu Shrine, Saigo-cho, alt. c. 10 m, 27 Nov. 1984, H. Kashiwadani 20769 (TNS); Fukuura, Goka-mura, alt. c. 3 m, 1 Dec. 1984, H. Kashiwadani 21033 (TNS). SHIKOKU. Prov. Awa, Sabase, Kainan-cho, Kaifu-gun, along the coast, alt. 5 m, 28 March 1978, H. Kashiwadani 14365, 14419 (TNS). Prov. Iyo, Iwayaji Shrine, Kamiukena-gun, alt. 500 m, 21 Oct. 1970, H. Kashiwadani 8481 (TNS); Mt. Kamegamori, Ishizuchi Mts, Kamiukena-gun, alt. c. 1800 m. Prov. Sanuki, Kankakei, Shodo-shima Isl., 13 May 1961, M. Togashi 61513 (TNS). Prov. Tosa, Mt. Umaji, Aki-gun, alt. c. 800 m, 20 Aug. 1969, H. Kashiwadani 6388 (TNS); Cape Muroto, Aki-gun, 24 July 1955, M. Togashi 55724 (TNS). KYUSHU. Prov. Hizen, Nagasaki, 1879, E. Almquist (H). Prov. Ohsumi, Yakushima Isl., 10 km W of Anbo, Yaku-cho, alt. 1160 m, 26 Oct. 1994, H. Kashiwadani 38562 (TNS). Amami Islands. Amami-Ohshima, 8 km WSW of Naze city, just N of small road, Yamato-son, Oshima-gun, alt. 240–260 m, 6 Feb. 1995, H. Kashiwadani 38751 (TNS). RYUKYU. Tokunoshima Isl., Mt. Inokawa-dake, Ohsima-gun, alt. 630 m, 21 March 1967, H. Kashiwadani 2009 (TNS). Ishigaki Isl., Mt. Fukai-Omoto-dake, 23 Aug. 1973, S. Kurokawa 73085 (TNS). BONIN ISLANDS. Chichijima Island, along Yatsuse River, near Joyo Fall, alt. 150 m, 21 Nov. 1968, H. Inoue 19006 (TNS); Mt. Chuo, alt. 300 m, 11 Jun. 1977, H. Kashiwadani 13941, 13962 (TNS); Miyanohama, alt. 5 m, H. Kashiwadani 14017 (TNS); Nakayama Pass, alt. 80 m, 24 Jun. 1977, H. Kashiwadani 14030 (TNS).

5. **Pannaria lurida** (Mont.) Nyl. in Mém. Soc. Sci. Nat. Cherbourg **5**: 109 (1857).

Collema luridum Mont. in Ann. Sci. Nat. Bot., ser. 2, **18**: 266 (1842) –TYPE: Sandwich Isl. (= Hawaii), Voyage 'Bonite', C. Gaudichaud (BM, lectotype, Jørgensen & Galloway 1992).

Thallus foliose, in orbicular patches 2–10 cm diam., resting on a matt of entangled, blue-black rhizohyphae. The lobes are discrete, elongated and thick with fawn, irregularly wrinkled upper surface which partly may be scabrous, PD+ orange (pannarin). Apothecia common, mainly found along lobe margins, to 2 mm in diameter with brownish disc and distinct, squamulose thalline margin. Ascospores 18–25 × 8–10 μm, perispore often apiculate at one end.

Notes: The variation of this species in Japan is surprisingly similar to that in North America (Jørgensen 2000). Only the collections in southern Japan belongs to *P. lurida* s. str., and match the description above. In the North (Hokkaido and northern Honshu) the specimens are smaller and rounder with enlarged, overlapping, grayish lobes, without protruding rhizohyphae. The spores are also smaller than in the main form and broadly ellipsoid, 10–15 × 10–12 μm without apiculate perispore, just as in subsp. *russellii* (Tuck.) P.M.Jørg., but often containing pannarin (PD+ orange), a fact that appears to be of little taxonomic importance. It is not likely that parallel evolution has taken place in the two continents. This rather indicates that a northern taxon had already been split off in Tertiary times or before, the remnants of which are now found disjunctively between northern Japan and northeastern America. This is a new and rather unexpected aspect of species with this "Tertiary relic pattern", most of which are warm-temperate (Culberson 1972).

Habitat and distribution: Mainly corticolous, in meridional forests of southern Japan, and in the North in cool-temperate forests of *Quercus*, *Salix* etc.

Selected specimens examined:

subsp. *lurida* – KYUSHU. Prov. Satsuma, Mt. Kaimon, 27 Oct. 1963, S. Kurokawa 63032 (TNS). IZU ISLANDS. Hachijo Island, Mihara-yama, S. Kurokawa 7009 (TNS). BONIN ISLANDS. Chichijima Island, Mt. Chuo, alt. 300 m, 11 June 1977, H. Kashiwadani 13917 (TNS).

subsp. *russellii* – HOKKAIDO. Prov. Kitami: Oniwaki mountain trail, Rishiri Isl., Rishiri-gun, alt. 300 m, 2 June 1995, T. Tønsberg 22520 (BG). Prov. Ishikari, Oshirarika-gawa, Mt. Shokanbetsu, 13 Sept. 1964, Y. Endo 2029 (TNS). HONSHU. Prov. Rikuchu, Logging area near Kadomaguchi 3-gome, Mt. Hayachine, alt. 850 m, 26 July 1967, S. Kurokawa 67104 (TNS).

6. **Pannaria tavaresii** P.M.Jørg. in Opera Bot. **45**: 68 (1978)–TYPE: U.S.A., Colorado, Larimer Co., Loveland Heights, 1953, E. Dahl (O, holotype).

Thallus foliose, rosette-forming, to 4 cm wide. Lobes up to 3 mm wide, adjacent to imbricate, flabellate; apices thickened, often crenate, somewhat frosted; upper surface blue-gray, slightly scabrous in parts with simple, terete, digitiform isidia along the margins. Apothecia not known for Japanese material. For further details see Jørgensen (1978).

Notes: This species has often been mistaken for *P. conoplea* (Ach.) Bory which is a smaller, cool-temperate species with marginal gymnidia, instead of isidia. The Japanese material is not entirely typical, in being thinner than usual with rather thin isidia, often occurring clustered. Similar specimens have, however, also been observed in subtropical parts of America (Jørgensen 2000). Their taxonomic status is unknown at the moment, but is likely to be the result of the ecological conditions. This species is easily separated from *P. elatior* by the rounder, more bluish thallus of different anatomy.

Habitat and distribution: A mainly corticolous subspecies of meridional, lowland forests, known from southern Japan. This is in accord with its mainly warm-temperate worldwide distribution.

Selected specimens examined. JAPAN. HONSHU. Prov. Shimotsuke, Nanbou, Kurobane-cho, Nasu-gun, alt. ca 500 m, 11 Aug. 1984, H. Kashiwadani 20750 (TNS). SHIKOKU. Prov. Awa, Kangase, Kainan-cho, Kaifu-gun, alt. c. 180 m, 29 March 1978, H. Kashiwadani 14399 (TNS).

Jørgensen is indebted for technical assistance when writing this paper to the following persons in his department: J. Berge, A. Botnen, A. Gystøl, B. Ingvartsen and T. Tønsberg. Our thanks also go to O. Vitikainen, the University of Helsinki, who most expediently has provided us with types and other material from H.

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Zahlbruckner A. 1924. Catalogus lichenum universalis III. Leipzig Figure texts:

P. M. ヨルゲンセン[a], 柏谷博之[b]：日本産ハナビラゴケ属の新種及び誤認種

日本産ハナビラゴケ属のうち，無性生殖器官を持つ 6 種について分類学的検討を行ったので報告する．このうち *Pannaria asahinae* P.M.Jørg. と *P. insularis* P.M.Jørg. & Kashiw. は新種である．また，*P. gemmascens* Nyl., *P. globuligera* Hue, *P. tavaresii* P.M.Jørg. は日本新産である．以下，各種について概略を述べる．

1）*Pannaria asahinae*（コハナビラゴケ，新称）：地衣体は樹皮生，径 3 cm 以下，鱗片状，濃褐色，周辺部は小裂片を持つ葉状体となり黒青色の下生菌糸を持つ．裸子器下部には特徴的な毛を持つ．地衣体の皮層は偽柔組織で厚さ約40 μm．胞子は無色，表面に目立たない皺をもち，12–15 × 7–9 μm．パンナリンを欠く（PD–）．本種の地衣体の色や形状はヒメハナビラゴケ（*Fuscopannaria leucostica*）に酷似するが，後者は裂片の縁に白色の縁取りがあり，子嚢先端部がヨードで染まるので区別できる．日本特産種で北海道から四国の山地帯に分布する．

2）*P. gemmascens*（イワノリモドキ，新称）：本種は E. Almquist により富士山 1 合目馬返しで採集された標本をもとに Nylnader（1879）により記載された種であるが，その後の記録はなかった．地衣体は鱗片状，蘚類と混生し帯青褐色，表面には裂片の伸張方向に走る著しい皺と裂片周辺部に青みがかったギムニジア（gymnidia，新称）が生じる．また，ギムニジア上にはテルペン類の針晶が析出する．これまでに見つかった個体は何れも子嚢果を持たないため，イワノリ属（*Collema*）として扱われてきたが（Hue 1906, Zahlbruckner 1924），地衣体の上皮層が偽柔組織となりトリテルペン類を含むのでハナビラゴケ属に含めておくのが妥当と考えられる．これまでに採集された地域は本州中部—広島県の数カ所だけである．

3）*P. globigera*（タマハナビラゴケ，新称）：地衣体は葉状，径 5–10 cm で基物に緩く付着する．裂片は巾 3–5 mm．表面は褐色－淡褐色で微細な皺があり，濡れると厚さ 0.4 mm ほどに膨れる．裏面は淡色，淡色－青黒色の毛がある．葉縁にギムニジアを持ち，パンナリンを含む（P+ 橙色）．本種はギムニジアを持ちパンナリンを含む点で *P. conoplea* に酷似するが地衣体表面に皺を持ち，共生藻の *Nostoc* の細胞が小さい（径 4–6 μm）点で異なる．また，Jørgensen（1994）が日本から *P. fulvescens* として報告したものは本種である．熱帯に広く分布する *P. fulvescens* は粉芽を持つので本種とは容易に区別できる．

4）*P. insularis*（ウロコハナビラゴケ，新称）：地衣体の形状やパンナリンを持つ点でテツイロハナビラゴケやキハナビラゴケに似ているが，地衣体が径 3 cm と小型で裂片の縁に鱗片をつけるので区別される．鱗片は白粉を欠き，歯状または瓦状に重なりあう．本種はパンナリンとテルペン類を同時に持つ点でハナビラゴケ属では特異である．テルペン類は *Fuscopannaria* 各種では普通に見いだされる成分であるが，これらとは明らかに異質である．本種は伊豆，四国—九州，琉球列島，小笠原に分布する．

5）*P. lurida*（テツイロハナビラゴケ）：本種の内，本州中部以南に生育するものは，裂片が分離して淡黄褐色を呈し，胞子は大型（18–25 × 8–10 μm），長円形で片側に胞子外壁を持ち，パンナリンを常成分とする．一方，本州北部以北に生育するものは，裂片が小型（径 2 cm 以下）で重なり合い，灰緑色を呈しパンナリンを含むものとこれを欠くものがある，胞子は小型（10–15 × 10–12 μm）で胞子外壁を欠く．同様の種内変異は北米産でも観察され，前者は subsp. *lurida*，後者は subsp. *russellii*（Tuck.）P.M.Jørg. として認識されている（Jørgensen 2000）．

6）*P. tavaresii*（コフキハナビラゴケモドキ，新称）：コフキハナビラゴケに酷似するが前者がギムニジアを持つのに対し本種は裂芽を持つ点で区別される．これまでに栃木県と香川県の二カ所からしか見つかっていない．